

Coherent x-ray studies of polymer membrane fluctuations and nanoparticle dynamics near the glass transitions.

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This talk will briefly review the emerging technique of x-ray photon correlation spectroscopy (XPCS). Then, it will present the results of recent measurements concerned with the dynamics of a concentrated nanoparticle suspension within a binary fluid mixture. In this system, the near-critical fluid degrees of freedom provide a means by which to continuously tune the strength of an attraction between the particles. The attraction, in turn, gives rise to remarkable, re-entrant glassy behavior in this system, which may be elegantly characterized by XPCS. In the next part of the talk, XPCS measurements of the dynamics of self-assembled block copolymer membranes within a dilute vesicle (L4) phase and within a sponge (L3) phase will be described, which occur in triblock copolymer-homopolymer blends. In the dilute L4 phase, the results are consistent with predictions for the dynamics of isolated membranes. In the L3 phase, there is a crossover from stretched- to highly-unusual, compressed-exponential behavior as the temperature is decreased. Finally, the prospects for XPCS measurements at the coming generation of even brighter x-ray sources will be discussed.